UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE
Summary Review of Monthly Reports*
for
SOIL CONSERVATION SERVICE RESEARCH**

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EROSION CONTROL PRACTICES DIVISION

Immediate and Residual effects of Mulch on Sweet Potatoes - O. R. Neal, New Brunswick, N. J.-"From 1944 through 1950 a plot study on the value of different conservation practices in sweet potato production was conducted at Marlboro. Among the treatments included were annual winter cover of rye and an annual mulch application of chopped cornstalks. The mulch application reduced the yield of sweet potatoes. Average yields during the 1945 through 1947 period are shown in the following table.

Average annual yields of No. 1 sweet potatoes - Bu. per acre

Treatment	Vine type	Bush type	Average
Check (no winter cover)	98	95	96
Mulch	65	58	62
Rye winter cover	106	116	111

"During the above period the mulch material remaining from the previous year was plowed under each spring and additional mulch applied after the potato plants were set. Beginning in the 1948 season, the mulch application was discontinued. The areas previously mulched were continued in sweet potatoes. Sweet potato yields during the 1948 through 1950 period are shown in table 2.

Treatment	Vine type	Bush type	Average
Check (no winter cover)	137	100	119
Previously mulched	172	130	151
Rye winter cover	181	151	166

"The residual effect of the mulch material favored the growth and yield of sweet potatoes as shown above. Surface mulch is a highly effective practice for soil and water conservation. The reason for the marked yield reduction under the mulch is not known as yet. Similar results have been obtained with tomatoes growing with surface mulches on this sandy soil. Additional studies are planned in which we hope to identify the causes of yield reduction under the mulching practice."

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** All research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

Tobacco Following Early Turned and Late Turned Winter Cover - C. S. Britt, Beltsville, Maryland.-"We have completed stripping the continuous tobacco plots and the yield figures are available. The quality evaluation will not be completed for sometime. The yields were lighter than in previous years, though the late-turned mixtures gave good tobacco yields as shown in the following table.

Yield of tobacco grown continuously following different winter covers and two dates of plowing. Beltsville, Maryland, 1950 crop season (average two replications - early plowing April 21, and late plowing May 23.

Covers	Yield per Acre Early	Late	Average
None	667	721	694
Ryegrass	814	869	842
Vetch	842	1213	1028
Mixtures:			
Wheat-Vetch	966	1221	1094
Rye-Vetch	1091	1181	1136
Ryegrass-Vetch	1076	1328	1202
Average	1044	1243	1144
Grand Average	909	1089	999

"The late turning of mixtures added 200 pounds of tobacco per acre on the average. During the 1950 season, all covers gave good yield increases over the bare plots."

A Summary of Monthly Amounts of Runoff from Several Cropping Systems for the 10-year Period 1941-50 - D. D. Smith, Columbia, Missouri.- "The data show that the amount of runoff can be significantly affected by the type of cropping. Fall seeded small grain, such as wheat, has allowed less runoff during the winter and early spring than even the grass-legume pasture areas. When growth begins on these other areas, runoff from them decreases to a minimum during the spring, summer and fall months. Rotations such as corn-oats have extremely high amounts of runoff during the winter when there is no living vegetation on the soil.

Month	RUNOFF (inches) Corn-Oats	Wheat & Lesp.	Soys-Small Grain-Mead.	Tim., Sw Cl pasture
January	0.62	0.29	0.51	0.46
February	.69	.39	.44	.27
March	1.41	.81	1.23	1.05
April	1.25	.99	1.26	1.02
May	1.49	1.43	.98	.84
June	1.79	1.77	1.02	.93
July	.72	.60	.24	.17
August	.29	.29	.02	.09
September	.92	.71	.47	.34
October	1.44	1.27	1.14	1.19
November	.60	.34	.25	.16
December	.51	.31	.40	.29
Total	11.73	9.20	7.96	6.81

Up and Down Hill Chiseled Fallow Caused Severe Erosion at Froid, Montana - Torlief S. Aasheim, Havre, Montana.-"Severe water erosion occurred at the time of the spring runoff on plots which were chiseled up and down hill.

"Frost at about the three foot level prevented soil moisture samples from being taken on fallow. This is the second consecutive year during which frost has been present in the soil at the usual sampling time. A limited amount of sampling indicated that stubble this spring is wet, to only a depth of about two feet, whereas a year ago stubble was wet to the depth of sampling which is five feet."

Hard Ground Listing is Favorable on Most Western Iowa Soils - F. W. Schaller, Ames, Iowa.-"During the month an article was prepared summarizing the results of tillage studies (seedbed preparation for corn) conducted in western Iowa during the past six years. Listing has proven to be a highly desirable method of planting corn on most soils in western Iowa. Corn yields from listing have been equal or better than those obtained with plowing. The corn crop is planted in less time and with less work. On hill land across slope listing has been very effective in reducing runoff and erosion. This article will appear in the June issue of Iowa Farm Science.

Wind Erosion in Relation to Cropping Systems - A. W. Zingg, Manhattan, Kansas.-"Wind tunnel tests were made on BPI plots at Scottsbluff, Nebraska during the first two weeks of April. The plots are irrigated and have been subjected to various cropping for about 40 years. The basic crop sequence is potatoes, beets, and barley. This sequence is grown without and with manure. In addition, three years of alfalfa is incorporated in the system to give a 6-year rotation. Plots in potatoes were found to be more erodible than those in beets. Due to residue cover, plots in barley were the least erodible. Greatest erosion occurred from the 3-year crop sequence. Where barnyard manure had been applied to the plots the potato plot lost only 4% of the soil in comparison with the plot which had not been manured. The incorporation of alfalfa in the system further reduced the erodibility."

Runoff in Relation to Cover Conditions on the Page Ranch - Joel E. Fletcher, Tucson, Arizona.-"During the month of April one aspect of the condition class of the Page ranch runoff plots as affecting runoff became interesting. It appears that there may be breaks in the curve between density of ground cover and percentage of a rain running off. For example, in the first two rains shown in the table on the following page there was little or no difference in the percentage of runoff between fair and excellent condition but a 2-fold difference between poor and fair.

Rain II	Range Condition Class: Poor	Fair	Excellent
		Percent of rain running off	
1	31	15	23
2	30	13	16
3	72	46	16

"It also appears that increasing the rainfall intensity affects the runoff progressively less as the range condition improves."

Relative Effectiveness of Components of Contour Strip Cropping - Ineffectiveness of Strip Cropping on Steeper Slopes - Glenn M. Horner, Pullman, Washington.-"A survey of erosion losses during the past winter season was made on several farms in Whitman County, Washington, and Latah and Nez Perce Counties, Idaho, in cooperation with Zone Conservationist Charles B. Ahlson a nd the respective Work Unit Conservationists. Three sets of paired farms were selected as examples of conservation compared with non-conservation programs. For each pair of farms, the erosion losses on the non-conservation farm were several times greater than on the farm where a conservation program was well established.

"The survey in Latah and Nez Perce Counties was made to determine the effectiveness of contour strip cropping. A wide range of soil and slope conditions was represented by the various farms. The effectiveness of strip cropping during the 1950-51 erosion season is summarized below:

1. Contour strip cropping was very effective on long gentle slopes that had permeable subsoils. The resistant strips absorbed most of the runoff from the up-slope wheat strips.

2. Contour strip cropping was only partially effective on the steeper slopes and on soils with slowly permeable subsoils.

3. A heavy crop of grain stubble, particularly if the land had been rough fall plowed, was the most effective cover for the resistant strip.

4. Alfalfa was one of the least effective covers for the resistant strip. It did not absorb an appreciable portion of the runoff from the up-slope strips, although the alfalfa did filter-out some of the soil material in the runoff.

"Soil samples for permeability analyses were obtained in the Ephrata and Yakima areas. Ten sites were sampled and represented problems in relation to irrigation and drainage."

Evaluation of Dry Farm Conservation Practices in the Lava Hot Springs Area - F. H. Siddoway, St. Anthony, Idaho.-"Erosion measurements were taken on four farms in the Lava Hot Springs area by Oscar Onstott, Portneauf work unit conservationist and myself. Most of the dry farms in this section are fairly steep and a sizeable portion of the topsoil has already been removed by past runoff. Soil losses this spring were caused by runoff water from melting snow. The soil was frozen during the early part of the runoff and little water entered the soil at this time. As the surface soil thawed from the surface downward it became saturated making conditions optimum for soil loss. Though this type of erosion is extremely difficult to control some of the conservation practices observed on the various farms proved beneficial.

"The Archie Miller farm was used as a check to compare the various conservation practices used on the other farms. This farm was plowed with a moldboard plow and little stubble was left on the surface. The average soil loss per acre for the winter wheat was approximately 60 tons as measured by the rill method. If the sheet erosion could have been measured this figure would have been considerably higher. The erosion losses on the Miller farm are fairly typical of farms on the steeper slopes in the area. Where most of the topsoil has already been lost and the white subsoil is exposed, rill erosion occurred within 10 feet of the crest of the slopes.

"The Elmer Johnson farm was contour stripped in 1948. A long uniform slope of 15 percent was divided into 14 strips approximately 125 feet wide. The land was plowed with a one way disk and a fair amount of stubble remained on the surface. The stubble strips were not subsoiled in the fall of 1950. The estimated erosion loss from the winter wheat strips was twenty tons. Approximately one fourth of this soil was deposited on the stubble strips. No new erosion occurred on the stubble strips. Seven tons of soil per acre left the farm in the spring runoff. Most of the soil loss on this field can be attributed to presence of gullies in the stubble strips that were caused by last years runoff. This 1951 runoff naturally followed these gullies and rate of flow was not retarded. Consequently, there was little deposition of soil in the stubble strips and rate of flow was not reduced materially. The 1950 gullies allowed the water to concentrate when it passed through the stubble strips and the beneficial effect that would otherwise be gained by strip cropping was not realized in this case.

"The Melvin Maughn farm is a good example of what can be accomplished when several erosion control measures are combined. This farm was contour stripped in the fall of 1948 with alternate stubble and winter wheat strips. An excellent sub-soiling job was done on the stubble strips in the fall of 1950 with the rotary sub-soiler. A fair amount of straw (about 2000 lbs.) remained on the surface of the winter wheat strips. There was a large snow drift formed at the top of the field due to the tall sagebrush that formed a partial windbreak. Erosion measurements were taken directly below this drift on a winter wheat strip and the most severe erosion was estimated to be 12 tons per acre. The major portion of the soil leaving this small area was deposited in the first 25 feet of the adjacent stubble strip. The holes left by the rotary sub-soiler on the upper edge of the stubble strip were filled completely by soil from the winter wheat strip. The ground was frozen when the runoff occurred and the

holes formed by the rotary sub-soiler filled with water and the soil in the immediate area of the hole thawed out sooner and allowed runoff water to penetrate much sooner than non-subsoiled land. Stubble left on the surface by the sub-surface plow also can be given a large share of the credit in keeping erosion losses low on this farm. The total soil loss from the whole farm was merely a trace, even though a small amount, probably not more than 2 tons per acre, was translocated from the winter wheat strips to the stubble strips.

"The Carl Munson farm was contour stripped with alternate wheat fallow strips and stubble strips were rotary subsoiled. Sweet clover was plowed down the spring of 1950 with a moldboard plow and very little crop residues remained on the surface. It was also necessary to disk after plowing to get a complete sweet clover kill. When considering the whole farm, erosion losses were difficult to evaluate owing to the variation in slope. On slopes up to 5 percent no erosion was evidenced. Ten percent slopes lost approximately 10 tons per acre and 15 to 20 percent slopes lost about 25 tons per acre for the winter wheat strips. Here again, the soil losses from the winter wheat strips were largely deposited on the rotary subsoiled stubble strips and the amount of soil leaving the farm was insignificant. The main reason the winter wheat strips on this farm eroded so seriously when compared to the Maughn farm can be attributed to the lack of stubble mulch and the pulverized condition of the soil caused by the disking.

Conclusions:

"1. When stubble mulching, strip cropping and fall tillage were all used, good erosion control was attained.

2. Land stripped but not stubble mulched or fall tilled was not effective alone as an erosion control measure.

3. Rotary sub-soiling in the fall was especially effective in controlling erosion and conserving moisture when done on alternate stubble strips.

4. Stubble left on the surface apparently distributed the runoff water and retarded the rate of runoff preventing the formation of erosive streams.

5. Gullies formed in the past years should be worked to prevent concentration of erosive heads of water.

6. All crop residues, sweet clover as well as stubble should be left on the surface if effective erosion control is to be maintained.

7. Land that had lost the major portion of its topsoil eroded regardless of erosion control measures used. Reseeding to permanent cover crop is the only alternative if erosion is to be controlled.

NOTE: We wish to compliment Mr. Siddoway upon the excellent manner in which he has made this report - F. G. Bell.

Rainfall, Runoff and Erosion in Relation to Cropping Systems and Land Condition - B. H. Hendrickson, Watkinsville, Ga.-"Mr. A. P. Barnett reports the highlight of the month from a rainfall, runoff and erosion standpoint was the storm of April 22, which occurred in the afternoon and fell on moist ground. 1.94" of rain fall in 40 minutes, after .79" of rain had fallen 12 hours earlier. The 5, 10, 15, 30 and 60 minute maximum intensities were as follows: 10.32, 7.08, 4.76, 3.56 and 1.94 inches per hour. With the exception of the 60 minute rate these are the highest rainfall intensities ever recorded at this Station.

"Despite the high intensities erosion from this storm can only be classified as moderate. Erosion losses were greatly influenced by tillage. All 1951 row crop plots had been turned several weeks earlier and were in a rough unharrowed condition which limited to a great extent both runoff and erosion. The following runoff plot summary sheet, table 1, gives the complete runoff and erosion picture for this storm. Oats typically allowed high amounts of runoff.

Table 1.-- Runoff and Erosion Plot Summary (April 22, 1951 - Storm of very high intensities).

Rotns. & Crops Rotn. Nos.	Class II Land 3% slope				Class III Land 7% slope				Class IV Land 11% slope			
	Rain fall	Runoff		Ero.	Rain fall	Runoff		Ero.	Rain fall	Runoff		Ero.
	in.	in.	%	T/A	in.	in.	%	T/A	in.	in.	%	T/A
1951 Crops	105' slope length				70' slope length				35' slope length			
(1) Cont. cotton	2.54	1.118	44.0	1.22	2.73	.710	26.0	2.95	2.66	.731	27.5	2.75
(10) cotton vetch	2.54	.776	30.6	.67	2.73	.586	21.5	1.64				
(10) corn crot.	2.54	.304	12.0	.89	2.73	.434	15.9	1.18				
Rotn. 10 Av.	2.54	.540	21.3	.78	2.73	.510	18.7	1.41				
(26) Oats[1] Kobe	2.54	1.308	51.5	.56	2.73	1.286	47.1	.88				
(26) cotton	2.54	.099	3.9	.24	2.73	.151	5.5	.26				
Rotn. 26 Av.	2.54	.704	27.7	.40	2.73	.718	26.3	.57				
(14) Oats[1] Kobe					2.54	1.478	58.2	1.16	2.66	1.406	52.9	1.50
(14) Vol.[2] Kobe					2.54	.064	2.5	0	2.66	.625	23.5	0
(14) cotton					2.54	.392	15.4	.88	2.66	.324	12.2	.52
Rotn. 14 Av.					2.54	.645	25.4	.68	2.66	.785	29.5	.67
(25) Sericea for hay									2.59	.021	.8	0
Rotn. 19 Oats -1st. Kudzu recovery	1 plot only								2.64	.438	16.6	.37
					35' slope length				70' slope length			
(1) Cont. cotton					2.73	.764	28.0	1.98				
(19) Oats & 1st[3] kudzu									2.64	.245	9.3	.60
(19) 2nd[4] kudzu									2.64	.466	17.7	0
(19) Corn									2.74	.210	7.7	.12
Rotn. 19 Av.									2.67	.307	11.5	.24
(25) Sericea for hay									2.59	.597	23.1	0
					.24 ac terrace interal							
(30) Plot A Alf. for hay					2.31	.342	10.3	0				
					19.2 ac. watershed							
Watershed W-1	8th kudzu & 1st rescue				2.70	.078	.3	--				

All plots are 20.74 ft. wide and are on Cecil soil.
1. Harvested for seed. 2. Harvested for hay. 3. October hay. 4. July hay.

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.-"Rainfall for the month of 3.10 inches fell on 17 days. There were no high intensities in any of these storms. Surface runoff was very small--less than 0.1 inch. Stream flow from the 303-acre watershed totaling 2.36 inches was, therefore, mostly ground water and seepage flow.

"Messrs. Youker and Dreibelbis report that tests of the Model A fiberglass blocks developed at Coshocton for soil-moisture observations show that they may have possibilities for use in determining water content of snow. The field data corrected to 31° F appear to establish a well-defined curve. More tests are needed in order to define the method and its application."

Hydrologic Studies - R. W. Baird, Blacklands Experimental Watershed, Waco, Texas.-"Rainfall has continued light with total for the month of April being 2.61 inches compared to a normal of 4.24 inches. The only storm of appreciable magnitude was the storm of April 25 with a total rainfall of 1.30 inches. About 1 inch of this rainfall occurred at intense rates, but the 20-acre watershed with ordinary practices was the only area from which any field runoff occurred, and the volume of runoff from this area was very small. No storms causing appreciable runoff have occurred since February 12, 1950. February of 1951 had rainfall 0.02 of an inch in excess of the normal, but the accumulated deficiency from normal since the first of September, 1950, now amounts to 9.54 inches. While at the present time there is sufficient surface moisture to start spring planted crops, there is a decided deficit of moisture in the subsoil.

"The rainfall during the month did not produce enough runoff to make any difference in the moisture comparisons on the cultivated areas. However, there was a difference in moisture percentages between the native meadow and Bermuda Grass watersheds. The percentages of moisture from these areas on April 27 at the designated depth intervals were as follows:

"Native Meadow SW-12: 0-6 inches, 33.7 percent; 6-12 inches, 29.8 percent; 12-24 inches, 24.3 percent; 24-36 inches, 20.3 percent; 36-48 inches, 16.8 percent; and 48-60 inches, 17.7 percent.

"Bermuda Grass SW-1Ø: 0-6 inches, 28.5 percent; 6-12 inches, 29.8 percent; 12-24 inches, 30.0 percent; 24-36 inches, 29.5 percent; 36-48 inches, 26.0 percent; and 48-60 inches, 24.2 percent."

Hydrologic Studies - J. A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebraska.-"In April 2.76 inches of precipitation was received at the Meteorological Station which was fairly well distributed over the month. The mean monthly temperature was 46.0 degrees which is about 4.3 degress below the long-time average.

"Oats was planted on the small watersheds the first week in April. Because of the cool weather germination was retarded and it was not until the end of the month the oats started to green up.

"Sweet Clover and Partridge Pea was planted on the seven wheat watersheds at the rate of 10 pounds of Patridge Pea, 5 pounds of Yellow Blossom Biennial Sweet Clover and 5 pounds of Huban Sweet Clover per acre. This is the second year that these legumes have been planted in the wheat thus introducing a legume in the 3-year rotation of corn, oats, and wheat on the small watersheds.

"An article was prepared on the accomplishments at the Central Great Plains Experiment Station which show that corn raised under contour and subtillage practices was worth from $7.20 to $10.80 more an acre at harvest time than straight-row corn on our small watersheds. The article also shows that the average peak rates of runoff on the contour and subtilled watersheds were from 27 to 46 percent less for 10 storms during 1950, depending on the crop."

Hydrologic Studies - R. B. Hickok, Lafayette, Indiana.-"April rainfall was significantly below 'normal.' Although rainfall was recorded for 17 days during the month, the maximum 24-hour precipitation was approximately 0.70 inch and there was no significant runoff from the experimental watersheds.

"Considerable work has been done during the month in tabulating and summarizing water-loss data with respect to changes in the types and condition of ground cover, during the crop rotation period. The following table gives estimates of runoff reductions resulting from the conservation system of soil management for different phases of the rotation:

Table 1.--Estimated runoff reductions from conservation system of soil management on experimental watersheds, Purdue-Throckmorton Farm, Lafayette, Ind.

Crop cover1/	No. of years measurements	Runoff reduction2/ % of rainfall	
Corn	8	7.1	∓ 4.3
Fallow (corn residues)	4	9.0	" 14.8
Soy beans	4	4.7	" 2.8
Wheat - Growing	6	6.8	" 4.6
" - Dormant	6	7.1	" 3.6
New meadow - Growing	6	1.5	" 1.8
" " - Dormant	6	6.6	" 5.9
Established Meadow - Growing	5	1.6	" 1.7
" " - Dormant	5	4.8	" 9.2

1/4-yr. rotation, C-Sb-W-ll. Fallow period from end of corn growth to seedbed preparation for beans. Wheat growing period includes from seeding to Nov. 15, and from April to harvest. New Meadow, from wheat harvest to May 1, ensuing year; and established meadow from that date until plowed under for corn. Dormant seasons for meadow are Nov. 1 to April 1.

2/Confidence interval computed for 5 percent probability of error. (analysis of percentages of a variable rainfall base is not strictly valid; but is considered to provide a feasible estimate with advantage of reducing variance resulting from variations of rainfall.)

"The decrease in the protein content of wheat and corn during the past decade has caused the concern of various groups utilizing the grain. The feed industry, especially, has been concerned over this decrease. Research conducted by Early and DeTurk of the Illinois Agronomy Department indicated that there were two major factors responsible for the decrease in the case of corn. They are: (1) Increased rate of planting and (2) Decreasing content of soil nitrogen. They concluded that the decline was not due to inherently low protein hybrids. The importance of the problem was indicated by their calculation that if the feed corn used in Illinois decline 1-1/2 percent in protein, it would cost the feeders

$8,710,000 to replace it with soy bean protein at 10 cents a pound.

"The nutritional importance of increased phosphorus and potassium contents is somewhat controversial. There seems to be good evidence, however, that grain of high mineral content will grade better.

"Table 2 shows that the nitrogen, phosphorus, and potassium content of the corn has been increased materially by the combined effects of the conservation practices. The higher rate of fertilization and the decrease in plant nutrient losses by erosion have contributed to the higher analysis of corn from the conservation treatment.

Table 2.--Chemical composition of corn removed from experimental watersheds
Purdue-Throckmorton Farm, Lafayette, Ind.

Year	Watershed	Practice	% by weight; dry basis; 70°				Yield
			N	P	K	Ga	Bu./A.
1949	10	Prevailing[1]	1.51	0.21	0.34	0.009	82
1949	15	"	1.51	.26	.38	.010	77
1950	5	"	1.58	.22	.33	-	75
1950	8	"	1.58	.22	.32	-	81
	Mean		1.54	.23	.34	.010	79
1949	14	Conservation[2]	1.58	.31	.37	.006	125
1949	18	"	1.59	.29	.41	.010	133
1950	6	"	1.54	.28	.34	-	107
1950	7	"	1.61	.28	.36	-	116
	Mean		1.58	.29	.37	.008	120

[1]Prevailing--straight row, 125#/A. 2-12-6.
[2]Conservation--contour planted and cultivated. 125#/A. 2-12-6 in rows; 1000#/A. 8-8-8 plowed under. 6 T./A. manure plowed under.

"It should be noted that this higher analysis of corn was obtained despite a higher rate of planting and greater plant nutrient removal by the crop from the conservation watersheds. The rate of planting was appreciably higher on the conservation watersheds so that the average ear weights would be the same from the two practices (most efficient ear weight for maximum yield).

"The above information on the effects of soil management on nutrient constituancy of crops was compiled by N. L. Stoltenberg.

"Our data thus show that a lower nutrient level of the soil is dominantly responsible for the decrease in the protein level of corn and proper land use practices can increase the protein level despite higher rates of planting.

"Table 3, on the next page, shows that nitrogen, phosphorus, and potassium content of wheat is likewise increased by combined effects of the conservation practices. The reduced content of calcium seems to be associated with the increased content of potassium

Table 3.--Chemical composition of wheat removed from experimental watersheds, Purdue-Throckmorton Farm, Lafayette, Ind.

Year	Watershed	Practice	% by weight; dry basis; 70°C					Yield
			N	P	K	Ca	Mg	Bu.A.
1947	10	Prevailing[1]	1.88	0.35	0.41	0.008	0.13	32.4
1947	15	"	1.74	.34	.42	.008	.13	25.6
1948	5	"	1.83	.34	.46	.016	.12	24.5
1948	8	"	1.85	.37	.48	.014	.14	23.4
1949	4	"	1.79	.35	.44	.027	-	32.5
1949	12	"	1.78	.34	.45	.025	-	34.6
		Mean	1.81	.35	.44	.016	.13	28.8
1947	14	Conservation[2]	1.90	.44	.44	.013	.14	27.5
1947	18	"	1.80	.45	.44	.008	.15	30.9
1948	6	"	1.98	.42	.51	.012	.15	36.6
1948	7	"	1.96	.41	.46	.008	.14	38.3
1949	2	"	1.86	.45	.50	.021	-	42.5
1949	11	"	1.80	.45	.48	.021	-	47.8
		Mean	1.88	.44	.47	.014	.14	37.3

[1]Prevailing--straight row; 150#./A 0-14-7- fertilizer.
[2]Conservation--contour drilled; 400#/A 0-14-7 fertilizer, plus 200#/A 10-6-4 as topdressing.

Hydrologic Studies - L. H. Stolzy, East Lansing, Michigan.-"Precipitation for the month of April, as measured by the U. S. Weather Bureau type of standard nonrecording rain gages, amounted to 3.15 inches at the cultivated watersheds, 3.80 inches at the wooded watershed, and 3.08 inches at the stubble-mulch plots. These amounts are approximately 122 percent, 147 percent, and 119 percent, respectively, of the 50-year average April precipitation of 2.58 inches. April precipitation can be expected to equal or exceed 2.58 inches once in 2.20 years.

"Although precipitation for April was above average, the amount received daily was low with the highest precipitation for any one day occurring on May 8 and amounting to 0.56 inch. Precipitation occurred on 14 out of the 30 days of the month. Precipitation in the form of snow was recorded for the first 3 days of April. This was accompanied by rain and so there was no accumulation of snow on the ground. On the 29th of the month we had a thunder-storm which was accompanied by rainfall of low intensity.

"On April 11 Mr. Miles Johnson from the U. S. Weather Bureau at East Lansing and some of the personnel from this Station set up a U. S. Weather Bureau evaporimeter. This is part of the cooperative studies between this Station and the Weather Bureau in which we furnish them certain weather data from our Station to be published in "Climatological Data."

"This study was prompted by the fact that the U. S. Weather Bureau had only one evaporimeter in the State of Michigan located in the Upper Peninsula; however, since the first of the year they have set up two in the Lower Peninsula, one at the Rifle River Project and the other here at East Lansing. It was felt by personnel from both offices that this type of data is needed in order to correlate evaporation losses in Michigan with other areas in the United States. We have at present considerable data on evaporation from a smaller type pan but are not able to correlate this with any other area because this is the only evaporimeter of this type

in the United States.

"On April 12 George L. Sherman, engineering specialist for the Soil Conservation Service Operations, called at this office for information regarding the approach section and the 3-H Flume. We loaned him blue prints of our installations which he felt would be of use in the construction of the flumes for the Rifle River project.

"On April 13 Wendell Schaller contacted this office at the suggestion of Mr. Schoenmann for certain hydrologic data. Mr. Schaller is investigating a special problem in which he is trying to correlate climatological conditions with pheasant crowing during the mating season.

"In the January monthly report it was mentioned that Mr. Arthur Wolcott from the Upper Peninsula Experiment Station called at this office to discuss the possibility of collecting humidity data which could be used in forecasting warnings to farmers of the possibility of potato blight. In response to this visit of Mr. Wolcott we have loaned for the summer a hygrothermograph to the Upper Peninsula Experiment Station. Professor Wheeler, the potato specialist in the Farm Crop Department, informs me that in order for the potato blight spore to infest thepotatoplant three different temperature and moisture conditions must be present. First, in order for the spores of the blight fungus to germinate a temperature of 40 to 50 degrees Fahrenheit plus water in the form of dew or rain must be present. The infection of the potato by the blight follows if the temperature does not exceed 73 degrees and the humidity is 97 percent, or above, followed by a temperature of 48 to 65 degrees Fahrenheit when the leaves are wet.

"It is believed by Professor Wheeler and personnel at the Upper Peninsula Experiment Station that the hygrothermograph will give them this temperature-moisture relationship in time for them to forecast warnings to the farmers that the blight spore is present and so to spray for it."

Hydrologic Studies - A. W. Cooper, Auburn, Alabama.-"The April rainfall of 4.76 inches represents 107 percent of the 70-year average of 4.46 inches for Auburn.

"In cooperation with SCS Operations personnel, 4 infiltration measurements were made using the simulated rainfall type-F infiltrometer (table 1). These tests were made in Mobile and Baldwin Counties on Irvington V. F. S. L. and Carnegie F. S. L., respectively.

"Mr. Lockett made permeability measurements on two soils and mechanical analyses on three soils at three depths and one soil at two depths (tables 2 and 3).

"Mr. Conniff spent a considerable amount of his time this month working on a reservoir which will be used to store irrigation water. The irrigation plots will be laid out this summer, but no actual tests will be started until the spring of 1952.

"Messrs. Kummer, Cooper, and Sanders (Drainage Engineer with Operations) spent part of the week starting April 9 studying terrace spacing in the coastal plain and Piedmont sections of Alabama. On this trip and previous trips, it was obvious that most of the water-disposal systems observed were not controlling erosion as they should. It was concluded on this trip that terrace spacing was not the fault of the water disposal systems. The lack of controlled outlets properly located was causing the serious soil movement in and soil losses from the fields. As a result of this and previous field studies, the Engineering Technical Committee on Soil Conservation Practices for Alabama are making an effort to get all agencies in

Table 1.--Summary of infiltration tests made with the infiltrometer on Alabama soils (April 1951)[1]

Test No.	Soil type	Soil surface condition	Depth of topsoil	Infiltration				Initial soil moisture			
				Total		Rate at end of		Depth (in.)			
				1st hr.	2d hr.	1st hr.	2d hr.	0-6	6-12	12-18	18-24
				Inches		In./hr.		Percent			
93, 94	Irvington V.F.S.L.	Good grass sod	6	0.36	0.02	0.02	0.00	22.75	17.77	18.07	20.45
95, 96	Carnegie F.S.L.	Bare & firm	9	.75	.45	.55	.39	12.59	13.17	17.21	17.70

[1]Data obtained jointly by SCS Research and Operations.

Table 2.--Permeability of soils (Alabama)[1]

Depth of profile	Depth of sample	Field moisture content	Moisture content saturated	Percolation		Volume weight	Water drained	
				Field moisture	Saturated		15 min.	15.h
Inches	Inches	Percent	Percent	In./hr.	In./hr.	Gm/cc	Cc/100 gm	
Irvington V.F.S.L.								
0"-6"	0"-3"	19.93	34.28	1.28	0.76	1.40	4.60	11.63
6"-20"	9"-12"	16.04	28.93	1.10	4.10	1.56	6.38	12.85
20"-40"+	22"-25"	17.99	27.44	.37	1.16	1.63	4.76	9.75
Carnegie F.S.L.								
0"-9"	0"-3"	9.88	36.00	4.30	1.15	1.38	10.80	18.87
9"-22"	14"-17"	13.82	32.57	.83	2.31	1.51	9.62	16.03
22"-36"	24"-27"	15.99	30.51	1.45	1.42	1.58	7.61	16.51

[1]Data obtained jointly by SCS Research and Operations.

Alabama working toward getting the farmers to properly locate and establish terrace outlet prior to building terraces. To date the committee has met with very favorable response. The big job ahead is to establish specifications for the construction of outlets where construction is needed and recommendations for establishing vegetation in outlets based upon research information.

"The Project Supervisor spent April 27 in the Black Belt District of Alabama observing the drainage work in that area with Messrs. Sanders, Hamilton, Schlaudt, and Sutton, SCS Drainage Engineers from Alabama, the Black Belt District, Region 2, and Washington, respectively. An excellent job is being done by the Soil Conservation Service on drainage in this district. The pan ditches with 8-foot-bottom widths, 12 to 36-inch depths with 4 to 1 side slopes in pastures were especially impressive. Most of these had good vegetation on the side slopes and bottoms. They were easy to cross mow with machinery. Many acres in this district had been brought into high productivity because of the drainage work by the Service.

"Three problems were pointed out on which research could be of assistance when fund and personnel are available: (1) the control of the outlet ends of shallow channel where they enter deep drainage channels, (2) the proper spacings and depths of shallow drainage ditches for various soil types, and (3) the control of willow trees in deep channels, possibly by cutting and spraying."

Table 3.--Mechanical analysis of soils (Alabama)[1]

Particle Size	Particle Description	Irvington - Depth 0"-3"	13"-16"	21"-24"
		Corrected average		
Mm.		Percent		
2	Gravel	0.00	7.07	10.29
2-1	Fine gravel	.04	.29	.17
1-.5	Coarse sand	.37	1.12	.85
.5-.25	Medium sand	4.89	4.54	4.41
.25-.1	Fine sand	18.07	17.92	8.87
.1-.05	Very fine sand	38.96	26.50	38.83
.05-.005	Silt	12.17	15.79	12.16
.005	Clay	25.50	26.77	24.42
	Total	100.00	100.00	100.00

Particle Size	Particle Description	Norfolk - Depth 0"-3"	12"-15"
		Corrected average	
Mm.		Percent	
4-2	Gravel	0.00	0.00
2-1	Fine gravel	1.55	1.10
1-.5	Coarse sand	19.55	21.94
.5-.25	Medium sand	39.68	41.00
.25-.1	Fine sand	.15	13.85
.1-.05	Very fine sand	29.08	9.97
.05-.005	Silt	2.40	1.87
.005	Clay	7.59	10.27
	Total	100.00	100.00

Particle Size	Particle Description	Orangeburg - Depth 0"-3"	18"-21"	22"-24"
		Corrected average		
Mm.		Percent		
4-2	Gravel	0.00	0.00	0.00
2-1	Fine gravel	1.54	1.71	1.02
1-.5	Coarse sand	19.18	17.35	15.76
.5-.25	Medium sand	24.25	20.84	18.98
.25-.1	Fine sand	7.29	10.13	9.58
.1-.05	Very fine sand	25.34	16.63	17.02
.05-.005	Silt	9.20	11.49	8.60
.005	Clay	13.20	21.85	29.04
	Total	100.00	100.00	100.00

[1]Data obtained jointly by SCS Research and Operations. Textural classification as determined by mechanical analysis:
Irvington: Sandy clay loam - all levels.
Norfolk: Sand - 0"-3"; sandy loam - 12"-15".
Orangeburg: Sandy loam - 0"-3"; sandy clay loam - 18"-21" and 22"-24".

Table 3.--Mechanical analysis of soils (Alabama)[1]--Continued

Particle Size	Description	Carnegie - Depth 0"-3"	14"-17"	24"-27"
		Corrected average		
Mm		Percent		
2	Gravel	5.77	3.09	13.34
2-1	Fine gravel	.11	.03	.02
1-.5	Coarse sand	2.33	2.12	1.49
.5-.25	Medium sand	7.37	6.12	4.63
.25-.1	Fine sand	31.75	25.38	4.19
.1-.05	Very fine sand	21.23	10.05	22.47
.05-.005	Silt	16.24	26.88	30.30
.005	Clay	15.20	26.33	23.56
	TOTAL	100.00	100.00	100.00

[1]Data obtained jointly by SCS Research and Operations.
Textural classification as determ ned by mechanical analysis:
Carnegie: Sandy loam 9"-3"; sandy clay loam 14"-17";
loam 24"-27".

Hydrologic Studies - T. W. Edminster, Blacksburg, Virginia.- "Messrs. Holtan and Kirkpatrick report: During the period of April 3-7, Mr. Holtan visited the SCS Experiment Station at Coshocton, Ohio, obtaining data on detention-discharge relationships of runoff flows from observed watersheds. These watersheds are considered comparable in terrain to similar sized watersheds in the vicinity of Staunton, Va.

"Messrs. Warner and Wilson, Hydraulic Engineers with SCS Flood Control at Staunton worked with Holtan and Kirkpatrick at Blacksburg, Va., on April 10 discussing the application of the data obtained at Coshocton, Ohio.

"Mr. Holtan met at Staunton with Messrs. Warner, Wilson, and Jim Weir, Hydraulic Engineer, from the Regional Office, April 17-19 in further discussion and trial application of Coshocton data, TVA data and USGS data on detention-discharge to the Staunton area. It was concluded that the method of Holtan and Kirkpatrick would be used to relatively estimate the runoff from various watersheds at Staunton and that other methods together with a few cases of actual measurements of runoff be used to orient the relative estimates. It appears evident that Yarnell's rainfall expectancies are far too low for the Staunton area. A few actual occurrences indicate approximately 1.5 times Yarnell estimates. Infiltration capacities are computed as the lower of two limits: the limit imposed by vegetation or lack ot it and the limit imposed by soil permeability."

Farm Ponds - T. W. Edminster, Blacksburg, Virginia.-"Mr. Holtan and Mr. Kirkpatrick have begun the testing of samples of sandy soil from the Eastern Shore of Virginia for sealing qualities. Considerable difficulty is anticipated due to the fact that these are rounded sea sands. Clay bonding is better adapted to sharp angular sand particles than to the rounded particles of sea sand."

Runoff Studies - N. E. Minshall, Madison, Wisconsin.-"Precipitation at Edwardsville for the month totaled 2.49 inches and was well distributed during the first 20 days with only a small amount of surface runoff. The season appears to

be very late as there was little sign of life in the trees on April 18.

"Precipitation at Fennimore for the month totaled 5.74 inches, or nearly twice normal. The total precipitation January through April is 12.1 inches, compared to the normal for the period of 7 inches. The rainfall during the month of April was well distributed and there was very little surface runoff. The late, wet spring has seriously delayed the farmers field work. Frost free ground which allowed all of the snow to be absorbed and the heavy spring rains have raised the shallow ground-water level. There have been reports of dry springs re-appearing or wells which had gone dry having a good supply of water again. Temperatures varied from a maximum of 78 degrees on the 17th. The minimum for the month being 41-1/2 degrees or about 5 degrees below normal."

Hydraulic Studies - F. W. Blaisdell, Minneapolis, Minnesota.-"The research report covering the box inlet drop spillway tests was completed, checked, and the multigraph plates were typed. By the end of the month, the report was ready for reproduction. The design report was revised in line with suggestions from the reviewers, and at the end of the month the plates for this report were being prepared. In addition to this work, Mr. Blaisdell roughed out a technical paper covering the box inlet drop spillway tests.

"Two drop inlets for pipe drop inlet spillways were tested during April. The pipe entrances were square-edged, the pipe slope was 30 percent, and the drop inlets were 3.5 pipe diameters deep. The first drop inlet was 2 pipe diameters square and its entrance loss coefficient was about 0.7 of the velocity head. The second drop inlet was 1.5 pipe diameters square. Its entrance loss was 0.8 times the velocity head. Previous tests on a drop inlet 1.25 diameters square had shown its entrance velocity coefficient to be about 1.0 times the velocity head.

"The point gage carriage for the straight drop spillway was installed and leveled, minor appurtenances were installed, and the type-H measuring flume was calibrated during the first half of the month. When the set-up was placed in operation, considerable erosion of the approach channel bed took place close to the structure and, in order to insure similar approach conditions for all the tests, this section was paved with concrete. The paved approach channel has a bottom width equal to the notch width and 1 on 2 side slopes. Mr. Donnelly began testing the outlet on April 20, and 11 tests were completed by the end of the month. Tests were made to determine the action of the straight drop spillway and to study different baffle systems. They were largely exploratory in nature. It is too early to make any definite comment on the baffle system to be used, but it seems likely that both longitudinal sills and floor blocks will be required."

Hydraulic Studies - D. A. Parsons, Minneapolis, Minnesota.-"A considerable amount of time was devoted to the assembly of the test data and to a first draft of a report on the tests of the Coshocton-Type Runoff Sampler. A conclusion from this study is that when the sampler is used along with an independent means of measuring the total runoff, the proportion of the runoff extracted by the sampler may vary widely with changes in runoff rate without seriously affecting the accuracy of the soil loss estimate. On the other hand, the accuracy of the soil loss estimate will be directly affected by a tendency of the sampler to divide the transported materia differently than it divides the water. It is axiomatic that fine material, uniformly distributed throughout the flow, will be divided by the sampler as the water is divided. This is not so for the relatively coarse and heavy material which tends to concentrate near the bottom of the flow. The tests have shown that these samplers catch relatively more of the bottom portion of the flow than of the top

portion. This tendency becomes increasingly more pronounced as the discharge through a particular device increases. Thus, the accuracy of the device and of the soil loss estimate is a function of the type of material being transported. It is also self-evident, in this regard, that the sampler must sample the entire cross-sectional area of the flow to obtain a representative sample, if the concentration of the transported material varies over the cross section.

"Orville Hays found that the samplers of the current design would not start operating at some wheel positions when a trickle flow occurred. The starting was greatly improved by drilling a small hole in each vane near the center of the wheel; however, the action was not yet completely dependable."

Supplemental Irrigation - J. R. Carreker, Athens, Georgia.-"William B. Land reports that hydrologic measurements for April included:

"Rainfall - 4.55 in., evaporation -5.99 in., wind movement - 1275.5 miles, maximum temperature - 86° F. on the 26th and minimum temperature 29° F. on the 4th and 5th. The rainfall was well distributed throughout the month and somewhat hampered tillage operations because the soil was too wet most of the time.

"We spent the month on various jobs preparatory to establishing the several crops on the different plots.

"Vegetation weights in the fescue grass pasture were measured April 26. The oven dry measurements on the irrigated and unirrigated pastures showed the following production where the ammonium nitrate was applied in dry versus liquid form:

	Irrigated pasture		Unirrigated pasture	
	Liquid nitrate	Dry nitrate	Liquid nitrate	Dry nitrate
	Tons per acre			
Total growth	1.29	1.78	1.18	1.13
Growth consumed by heifers	1.02	1.32	.76	.71
Amount unconsumed	.27	.46	.42	.42

"There were eight yearling Jersey heifers on the 3 acres in this study from March 30 to April 26. They grazed all areas at will. Therefore, the average consumption was 0.0128 tons or 25.7 lbs. per heifer per day on the pasture.

"We loaned our big pump to the School of Forestry and helped them set up a sprinkler irrigation system on their seedling nursery on April 17. Nursery practice is being taught and the 1/2-acre nursery was developed in that course. Irrigation of tree seedlings is a standard nursery practice in this State.

Supplemental Irrigation - T. W. Edminster, Blacksburg, Virginia.-"The total rainfall for the month at the irrigation control plots was 4.51 inches. Six steers were placed in each of the four lots of the pasture irrigation experiment on April 20. It was believed that the irrigated lots were overstocked in 1950 for the best pasture management.

"The irrigation control plots for corn and tobacco have been plowed. The alfalfa plots have made a growth of about 8 inches.

"Both the pasture and control plot irrigation systems have been partially set up for the 1951 season."

Drainage Studies - J. C. Stephens, West Palm Beach, Florida.-"Field observations were made on an improved moling machine. This machine was constructed by the Belle Glade Machine Works, is equipped with a new steel bullet, is ventilated as in previous machines but differs from the older type by having a hydraulic jack arrangement operated by a small gear pump which enables the operator to raise and lower the mole very easily. From early tests, it appears that this machine has several advantages. Photographs and plans can be obtained from the project.

"Informal cooperation was continued with the Corps of Engineers on Field Permeability Studies in the Everglades. Observations were made on the seepage tests run by the Corps on the retention basin model constructed west of Miami near Chrome Ave. and Tamiami Trail. No conclusions were drawn from the original tests which will be continued when certain modifications of technique have been made."

Drainage Studies - M. H. Gallatin, Homestead, Florida.-"From past records the total rainfall for the period was about the same as for previous years. Rainfall for this period varied from 3.4 inches in the southwestern portion of the area to 6.50 at the Eureka Drive Gage. Though the average rainfall was about the same practically all of the rain fell during the period April 8 through April 10. Showers were recorded on 12 days at the gages throughout the area. With the major portion of the rainfall occurring on 2 days and little or no rain previous to this or after this date, we had a steady decline in our water table from the middle to the end of the period.

"Readings on all of the mulch plots at the first of the period were high except the shavings mulched plot. During the period April 8 to April 10 approximately 3-3/4 inches of rain fell in this area. Readings on April 12 were quite low for all of the plots. From this date to the end of the month the readings increased slowly until April 27 and then jumped rapidly in the natural cover and check plots. The readings in the shavings and pine straw plots increased slowly. Readings in the grass mulched plot on April 27 had increased more than the pine straw or shavings mulched areas. This increase is due mainly to the fact that the material has deteriorated and needs renewing. While there has been a slow accumulation of mulching material on the natural cover plot it is a very slow process and has not materially increased the moisture holding capacity.

"Readings made on the moisture block in the citrus and lime plantings during this period were at the wilting point just prior to April 8. With 3 to 5 inches of rain falling generally across the area on April 8 through April 10, readings made on April 12 were low for all blocks. From April 10 to the end of the month no rain fell and on April 27 all of the citrus and lime blocks were at the wilting stage.

"Readings made in the avocado block of mature trees receiving no irrigation had reached the wilting point during the early part of the month. Rains occurring from April 8 to April 10 reduced the readings. With no rainfall after April 10 readings increased and by April 27 had again reached the wilting point.

"The irrigation rate and cycle investigations were carried on during this period.

"Samples collected in the Miami area on April 11 show that the concentration of chlorides were slightly lower on the whole than the samples collected the previous month. This lowering was no doubt caused by the general rains over the area on April 8 and April 9.

"Samples collected in the Homestead area on April 19 show that there was a slight decrease in the concentration over most of the area. This lowering was the direct result of the 3-to 5-inch rain which occurred during the period April 8 to April 10.

"Since the winter of 1947 samples have been collected from the Highlands Chloride Line. This line starts at the end of Long View Road at the north center of Section 11, T-58, Range 38E and extends straight south to the coast. Station 0.00 is at the end of Long View Road.

"Following are the results of analyses of samples collected from this area since 1947.

End of long view	3/38/47	3/16/47	5/14/47	3/18/49	3/9/50	4/14/50	5/16/50	4/5/51
0.00 mi.	340.0	340.0	417.5	74.5	132.0	167.0	131.0	
.5	336.0	703.0	75.0	87.0	485.0	382.0	146.0	
1.0	615.0	297.0	231.25	188.0	224.0	224.0	210.0	
1.5	191.0	280.5	294.0	117.0	156.0	378.0	440.0	
2.0	232.0	338.0	304.5	132.0	229.0	282.0	370.0	
2.5	328.0	363.0	211.0	227.0	181.0	770.0	752.0	
3.0	327.0	434.0	209.0	232.0	260.0	430.0	355.0	
3.5	213.0	193.0	306.0	120.0	253.0	245.0	290.0	
4.0	201.0	363.0	187.0	228.0	258.0	106.0	330.0	214.0
4.5	430.5	327.0	384.0	238.0	270.0	460.0	640.0	415.0
5.0	340.5	378.0	767.0	108.0	218.0	340.0	474.0	404.0
5.5	322.5	194.0	312.0	385.0	260.0	235.0	324.0	210.0
6.0	389.0	324.0	614.0	231.0	244.0	388.0	445.0	410.0
6.5	258.0	228.0	454.0	114.0	180.0	345.0	370.0	540.0
7.0	428.0	309.0	360.0	556.0	248.0	344.0	500.0	1,700.0
8.0	903.0	122.0	1,300.5	1,800.0	2,100.0	2,000.0		5,600.0
8.5		1,140.0	2,250.0	2,860.0	1,470.0			8,400.0
9.0		3,180.0	5,635.0	10,200.0	1,500.0	5,600.0		29,300.0
9.5			35,076.0	4,920.0	2,400.0	12,800.0		
10.0			41,440.0	17,150.0	5,950.0	30,400.0*		

*Sampling taken at 9-3/4 miles.

"It will be noted that concentrations sufficiently high to kill tender green beans were found at the sampling point 6.5 miles below the end of Long View Road. This is a mile further north than we have ever found the concentration so high except for March 18, 1941 when the sample collected at 7.0 miles was 556 p. p. m.

"Indications are that part of this increase is due to the fact that our rainfall during last summer was low and the chlorices were not as completely flushed out as previous years. Also another contributing factor this year was the lack of general rains throughout the winter season."

Drainage Studies - E. G. Diseker, Raleigh, North Carolina.-"Recently the soil over the old 4-foot depth tile (now 3 feet deep) was subsoiled to a depth of 16 to 22 inches with a Fergusson subsoiler. The soil was very dry and the depth varied with the compactness of the soil as the hydraulic lift would not hold the subsoiler to a constant depth. In most instances the tractor was operated in second gear. The subsoiler was operated across the five tile lines at right angles to the tile at 5-foot intervals. Then four throughs were made on each side of each tile line at 3- to 4-foot intervals. The soil breakage as a result of subsoiling was 12 to 18 inches wide horizontally at the bottom of the furrow and 4 to 5 feet at the soil surface."

Drainage Studies - I. L. Saveson, Baton Rouge, Louisiana.-"During the month the soil mapping of all our test areas was completed by the soils personnel of the Service.

"Operations personnel requested that the project assist them in working out techniques for land leveling and grading of land for drainage in the Northern part of the State, this northern part of the State being the cotton section. One district has purchased a land leveler. Also in the rice area the project supervisor has been asked to sit on a committee for grading of rice land."

Drainage Studies - T. W. Edminster, Blacksburg, Virginia.-"On April 11 and 12, Mr. R. R. Covell of the Regional Office visited the project to study laboratory techniques in the soil permeability program. This visit is a part of the program to assist in further correlation of the permeability work throughout the Southeast.

"Mr. Turner reports that laboratory determinations have been completed on sites VA-278 through 280. A considerable portion of his time has been spent in assisting Messrs. Holtan and Kirkpatrick in the utilization of permeability data in the hydrologic studies on Minor Watershed A-2 of the Flood Control Program, and also in assistance to Mr. Walker in his work of correlating permeability with draw-down curves.

"Mr. Walker reported last month that 'a somewhat different approach for correlating soil permeability to soil drainage characteristics was being tested. While not included in the report, data from site 12, pump site on Lee farm, was used for the test. This month the test was expanded to cover data from site 10, tile drainage system - Rawls farm, and site 9, open ditch system - Harrell farm.

"The patterns of calculated water-table curves conformed favorably to the observed curves. On the other hand, the rates of water-table recession differed considerably. Calculated rates approximately equaled the observed rates on the Lee farm. But on the Rawls farm the calculated rate greatly exceeded the observed rate and on the Harrell farm it was a little more than half the observed rate.

"Since the patterns of the water-table curves are comparatively similar, it seems as though this method of correlating data has considerable promise. However, the factors that cause the variations in rates of water-table recession must be determined before that method is applicable for general use.

"During the month the following factors were noted to hinder the accuracy of computations:

1. Frequently the soil profile descriptions of either the soil permeability determinations or the draw-down sites, or in some cases both, are not detailed enough for comparison. In such cases the soil permeability determination used for analysis must be selected solely upon the proximity of the location of sample to draw-down site. This procedure defeats one of the objectives of the project.

2. Some of the permeability determinations do not contain measurements for each horizon of the profile to a depth equal to the drainage laterals. Sometimes the permeability values may be estimated but usually the correlation cannot be made.

3. The lack of replication of sites for permeability determinations weakens the data.

4. Varying patterns of observed water tables make it difficult to compile characteristics of water-table conditions.'

"The project personnel in preparing plans for the 1951-52 program have decided to close out the work on the S. W. Lee farm when the cooperative agreement expires in June. It is planned, however, to continue the work on the H. G. Presson farm for another year.

"Mr. Walker has prepared an abstract for a paper entitled 'Permeability Aspects of Drainage Research in Virginia' to be presented before Sections I and VI of the Soil Science Society of America at its annual meeting at State College, Pa., in August."

Sedimentation Studies - L. M. Glymph, Jr., Lincoln, Nebraska.-"Significant progress was made during the month in setting up the program of sedimentation investigations for the Medicine Creek watershed in western Nebraska. The USGS installed temporary wire weight recorders for stage determinations and began collecting sediment samples at four new stations. Rain gages were established at seven localities by the Weather Bureau and the Bureau of Reclamation. The project supervisor and representatives of the USGS spent several days during the month developing a program of engineering surveys to be undertaken on Dry Creek, a tributary having a watershed of about 20 square miles.

"It is planned that detailed studies of sediment sources will be made on the Dry Creek subwatershed. One of the new sediment stations is being established on this tributary to provide a measurement of total sediment production. At the sampling station, the Dry Creek channel is about 50 feet wide on top and has nearly vertical banks 15 to 20 feet high. The degree of incisement varies considerably but extends upstream from the station for a distance of about 6 miles where there is a vertical overfall 20 to 25 feet deep. The channel is 40 to 50 feet wide at the overfall on the main stem. A number of tributaries confluencing along the channel have likewise become incised and are advancing by progressive stages of headcutting. Channel profiles and cross sections are being taken at the present time by a Bureau of Reclamation survey party and will be re-run periodically in the future to establish the rate of channel erosion and the amount of sediment derived from this source. Soil Conservation Service, Region 5, is planning to make a detailed conservation survey of the watershed this field season to provide information useful in estimating the rate of sheet and rill erosion and the amount of sediment derived from these sources. A number of phases of the Dry Creek and Medicine Creek studies have not yet been developed in detail but it seems that good progress is being made on this cooperative undertaking.

"The range lines established in the fall of 1949, on Ashland Reservoir, near Columbia, Mo., by the Soil Conservation Service, the Missouri State Conservation Commission, and the University of Missouri were re-run during the month. Field work of this resurvey was accomplished by the Soil Conservation Service field office at Kansas City, The Conservation Commission, and the University. Results of this resurvey will be computed by the project supervisor in the near future."

Sedimentation Studies - R. Woodburn, State College, Mississippi.-"Mr. John W. Roehl of the Regional Office, Water Conservation Division, worked with us April 3 to 13 and Mr. L. C. Gottschalk, Head of Sedimentation, Research, was with us April 9 to 13 on analysis of data from the Sedimentation Survey, Yazoo Watershed.

"An attempt was made to correlate measured sediment with gross erosion, age of reservoir, drainage area, capacity-watershed ratio, singly and in combination.

"It was very difficult to arrive at a satisfactory method for computation of gross erosion and therefore considerable uncertainty attends this quantity.

"There seemed to be a tendency for gross erosion to be lower than measured sediment on some of the younger reservoirs. This suggested a rain effect which needed further study.

"Accordingly it was decided to complete a preliminary calculation showing compositeeffect of each of the four variables recognized on reservoir sediment until a more comprehensive analysis involving rainfall could be undertaken.

"In the meantime a study has been initiated on State College runoff plot data. We wish to ascertain if there is a correlation between certain rainfall characteristics throughout the year and the yearly total soil loss from our old bare 'yardstick' plot. These findings may provide a guide in the application of Memphis rainfall data to the reservoir data.

"We are also concerned with the Bluff live creek problems but have not been able to give much time to that question lately.

"On the 17th Mr. Burford and I assisted by Mr. Charlie Vaughn, Flood Control, installed two crest gages on Thompson Creek at 500 feet and 1,000 feet respectively above the gaging station on the McCarley bridge. We are hoping to secure information on water-surface slopes for velocity studies.

"We are also thinking about the question of caving banks on these streams. A matter of particular concern is the difference in severity of bank caving at the south end of the bluff and further north. On April 18 a conference was held with Mr. W. L. Heard of Flood Control on this matter.

"A rough draft of this conference and field inspections is reproduced as follows:

"On April 18, 1951, Mr. James B. Burford and the writer of the Research Division and Mr. A. R. Burford and W. L. Heard of Flood Control held a conference at Winona to discuss some of the problems facing Flood Control and involving Research in the Lower Bluff Section of the Yazoo River Watershed. It was felt that an attempt should be made to appraise the present operations program from the standpoint of completeness of objectives and efficiency of treatment. It was further decided

that the actual problems should be more completely isolated and identified in order to determine if the current program is pointing toward the proper objectives. In other words, what is the real problem involved on the Bluff Line Streams? Are we doing anything to solve the problem and if not, what can be done? Is our problem a matter of prevention of silting and sanding on the Delta between the Yazoo main stem and the Bluff Line, flood damage over the same area or bank caving, sedimentation and flooding in the stream valley in the hill section, or is it a combination of all of these.

"It was mentioned that some landowners have reported that they consider sedimentation not a damage but actually a benefit on the cone section of Big Sand Creek.

"Mr. Heard pointed out that the survey report on the Yazoo did not involve any study or recognize any problems or make any recommendations for the Delta section immediately adjoining the Bluff Line. He further pointed out that in the work of the Flood Control office in Mississippi, in cooperation with landowners in the Bluff Line section, several problems had been recognized:

(1) Control of water from foot hills and prevention of water damage in the Eastern Delta.

(2) Control of sediment from the foot hills.

(3) Destruction of valley land in the Hill section by stream meandering, caving, etc.

(4) Correction of land use; that is, effective erosion control in the upland section of the Bluff Line watersheds.

"We then reviewed the memo. submitted by Mr. A. C. Allnutt in the fall of 1949 outlining a number of different research needs for developing information and design data for Flood Control use. Dr. Nichol's letter to Mr. Heard emphasized certain of these points but not all of them as a basis for a research program was also discussed. The group recognized that there appears to be a difference in the degree of damage to valley lands at different portions of the Bluff Line. Mr. Heard pointed out that it was his observation that bank caving and subsequent destruction of valley lands appeared to be less on Black Creek than on any other of the Bluff Line streams. It was then decided that the group should inspect certain of these points in the field. Since Big Sand Creek was fairly well known to each member of the group, we decided to go to Lexington and study Black Creek. We proceeded down the gravel road marked as Highway 17 from Carrollton to Lexington examining in some detail the crossing of Pelucia, Abiaca, Chicopa (kudzu planting on the bank needs further study), Fannegusha, and Black Creek. The party moved from Lexington to Howard some 8 miles down the Valley of Black Creek with observance of a large amount of sand over the alluvial plains left by the 9-inch rain of some 3 weeks ago. Along several reaches of this stream, bank stabilization seems to be fairly well advanced. There is a good channel with a flat sand bed, sloping banks with willows and other vegetation. The channel seems to have a capacity of probably 8,000 to 10,000 cubic feet per second and with a low-water velocity of probably 2 - 2-1/2 feet per second. There appeared to be comparatively few cases of uncontrolled bank caving. Such caving banks again appeared to be in silt material rather than sand material. This channel apparently feathers out to very shallow dimensions after passing Howard Station (Y & MV RR) at the Bluff Line.

"After returning to Lexington, we proceeded up Tarrey Creek along the south side of the flood plain to Owens Wells, thence northward to Highway 12 and westward 1/2 mile or so to a badly caving bank said to be one of 2 such caving sections on the portion of the stream south of the Y & MV and east of Lexington.

"We then proceeded northeast from Lexington toward Bowling Green observing the stream at a point about 3 miles northeast of Lexington at a steel bridge where a well-stabilized channel was found. The stream was visited again about 3 miles west of Bowling Green on the Joynson farm where again a well-stabilized section was found. At this point a concrete control had been constructed about 7 years ago to provide shallow storage for pumping to irrigate a bottomland field. There appeared to be little evidence of caving banks and such problems in the section between Lexington and Bowling Green.

"There is s aid to be a valley plug near Bowling Green, but this was not visited. In general from Lexington eastward, Black Creek is a better behaved stream than Big Sand Creek, and the reasons for this are not apparent at this time. I feel that this may be related to the watershed shape as Big Sand Creek is well behaved east of McCarley; however, 2 miles west of McCarley where Magic and Thompson enter Big Sand below a fan-shaped watershed which results in runoff peaks being superimposed, a very bad bank condition prevails.

"One of the problems of research is to attempt to discover if there is a real difference between Black Creek and Big Sand and whether this difference can be explained.

"Such explanation may lie within the realm of watershed topography and shape or characteristics of soil material in the Flood Plain, or some other factors at this time not identified by name. Apparently, a broad examination needs to be made of all the Bluff Line streams from Black Creek north to Tillatoba. In such a study real differences if present should be identified, and if possible, watershed differences or other factors explaining the streams differences should be discussed. If a real cause-effect relationship might be worked out on the basis of natural streams as they are today, it would undoubtedly be far cheaper and less time consuming than to attempt to set up research with field controlled factors and then attempt to isolate the effect of these factors. Such a study may be beyond the capabilities of the present research project with its limited staff, but should be given serious consideration at such time any expansion in research personnel can be affected."

WATER CONSERVATION AND IRRIGATION DIVISION

Irrigation Studies - Karl Harris, Phoenix, Arizona.-"Two days were spent in Yuma County with Joel Fletcher, studying the piping soils on the Yolo Ranch. A report of this piping condition with recommendations was made, and copies sent to Dr. Nichols and Mr. Clyde and Dean Burgess, University of Arizona Experiment Station.

"It was found that the intake rate of water into the soil was over eight times as fast as could percolate through a silty clay layer about 30 inches below the surface. It was also found that immediately above this tight layer was a very erodible soil. It was found that the tight layer had a slope of about 2 feet per 1,000 feet. Probably over one-half of the water applied to the 2,700-acre ranch leaves the ranch on top of the clay layer, and is wasted into the dry Gila River channel, producing luxuriant growth of mesquite between the ranch and the river channel and phreatophyte plants along the river channel rim adjacent to the irrigated land.

"The water flowing through this highly erodible soil on top of the clay layer has caused considerable underground erosion.

"An inspection trip was made to Safford to inspect the tillage experiment on the University Farm. The plan of the experiment was to irrigate one-half of the field with relatively salt-free river water, and one-half with well water containing about 4,000 p. p. m. total salts. One-half of the plots received an application of 2 tons of gypsum per acre; one-half of the plots were planted with no work on them after plowing and then irrigated. This is called rough tillage. The other half of the plots was disked and floated, then planted and irrigated. This is normal practice. The experiment had to be modified because after the first irrigation, which is the only heavy one, there was no more river water. As it stands at the present time, all of the plots will receive only pumped water for the remainder of the season.

"At the time of the inspection trip, it was found that the plots which received the heavy irrigation with river water had a much better growth of barley than the plots which had received only pumped water. The barley on the rough-tilled plots had made far better growth than the normal tilled plots. It appeared that the tillage had as much effect as did the river water over the pumped water. There was no visible difference in the growth of the barley on the plots which had received the gypsum over those which had not been treated.

"Many lettuce fields in the Valley have been affected by a yellowing condition this spring. This condition reduces the marketable heads of lettuce, and if the condition is bad enough, will result in a total loss. In cooperation with the Horticultural Department of the University of Arizona, a study was made of the cause of this condition.

"Core samples were collected to a depth of 24 inches in some instances, and the percolation rates, large pore space, and the apparent specific gravity determined on five different fields. There was found almost a perfect correlation between yellowing and a tillage hard pan. Where there was a pronounced tillage pan, the yellowing condition was present, and where there was no tillage pan, a high percentage of marketable lettuce was obtained. A report is now being made on this work and will be distributed.

San Fernando Valley Soil Conservation District (Assistance to Operations)- H. F. Blaney, Los Angeles, California.-"William W. Donnan reports, 'although the formal cooperative work on this project has been completed and the report written, the proposed remedial program is now being partially undertaken. Two of the three leaking artesian wells which contribute to the high ground-water problem have been cleaned out and plugged. Prior to this work the Research staff installed an additional 12 piezometer observation wells in the immediate vicinity of these artesian wells, making a complete grid of 30 water-table observation points. Readings were taken of water levels for several weeks prior to the recent well plugging in cooperation with Los Angeles City Engineer and Soil Conservation Service, Operations, staffs.

'On one of the artesian wells a series of flow observations were made after the pump had been pulled and before the plugging was done. A vertical current meter was lowered into this well and readings were made at 10-foot intervals. The following tabulation shows the estimates of flow at different levels in the well.

Flow in artesian well No. 202, San Fernando Valley, Calif.

Depth of meter in well casing	Estimated flow	Depth of meter in well casing	Estimated flow
Feet	Gals./min.	Feet	Gals./min.
1	35	60	60
10	40	70	30
20	45	80	10
30	50	90	10
40	55	100	10
50	60	108	Trace

'This well was plugged by pumping down 1,650 gallons of oil well mud into the well casing. This amount is about twice the volume of the 14-inch well through its 108 feet of depth. Thus it is believed that the outside area around the well casing has been sealed off as well as the well itself.'"

Reclamation of Saline Lands, Imperial Valley, Calif. - H. F. Blaney, Los Angeles, California.-"George B. Bradshaw and William T. Gish report, 'during the past 30 years considerable work has been done towards the reclamation of saline soils in the Imperial Valley.

'During early work in the 1920's water was ponded on the surface in periods ranging from a few days to several months to remove the surface saline elements to a deeper depth. Saline elements were also removed from the surface by washing or flushing water over the soil surface. Later on rice was planted in the ponds during the leaching periods as a reclamation crop. This type of reclamation was only temporary as the saline elements that were removed to a deeper level generally returned to the surface in from one to 3 years.

'With the installation of drainage tile and subsequent leachings the reclamation of saline soils has become practical and permanent. Saline elements that were removed to deeper depths during leaching periods are removed by the drainage systems as they slowly return towards the surface. Considerable salt is removed by the drainage systems during leaching but the greater benefit of drainage is in maintaining the saline ground water at a safe level and preventing the field from becoming re-saline.

'The following leaching theories have been proposed and partially proved by the Division of Irrigation's leaching investigations during the past 5 years:

1. When water is ponded over an area that has been tiled there is more water flowing to the tile lines from areas adjacent to the tile lines than from points midway between laterals.

2. When the ponded leaching water is removed, the ground-water table allowed to recede and a draw-down curve obtained by the tile lines, the flow into the tile lines originates from all portions of the field. As the draw-down curve falls more of the flow originates near the midpoint between laterals.

3. When leaching is practiced by long periods of pondings, tile lines in light soils may become overloaded and back pressures may occur in the downstream reaches of the tile systems.

4. When water is ponded the surface soil, in leaching plots, tends to deflocculate and segregate during a leaching period. In heavy soils this may become quite a problem with respect to infiltration.

5. Saline elements are displaced from the surface soils and deposited at depths of 20 feet or more during leaching periods.

6. Longer leaching periods are required, in heavy soils, to remove the salts to deeper depths.'"

Upper Santa Ana River Valley - San Bernardino County, Calif - H. F. Blaney, Los Angeles, California.-"Dean C. Muckel reports,'water users have often asked what the effect on the ground-water supplies is when irrigated areas are converted to residential or municipal areas. Data developed during the course of this study provides some information on the subject. The following table shows a comparison of the deep penetration resulting from water artificially applied in irrigated and municipal areas for the various basins of the upper Santa Ana River Valley. The studies are not yet complete as to the penetration of rainfall so the aggregate effect is as yet unknown.'"

Average annual deep penetration resulting from water artificially applied

Basin	Irrigated areas	Municipal areas
	Ac.ft./acre	Ac.ft./acre
Chino	0.27	0.90
Pomona	.23	.31 1/
Claremont Heights	.26	.88
Liveoak	.26	1.18
Cucamonga	.33	1.22
Bunker Hill (NW)	.23	.29 1/
Bunker Hill (SE)	.28	.28 1/
Devil Canyon	.24	1.21
Cajon	.03	1.00
Lytle Creek	.10	1.60
Rialto	.16	.98
Reche Canyon	.23	1.00
Yucaipa	.11	1.10
Beaumont	.12	1.12

1/Sewage from part of the municipal areas is exported from basin.

'The average annual water applications (not including rainfall) are:

Irrigated crops	Ac.ft./acre	Municipal areas	Ac.ft./acre
Annuals	1.67	Residential	1.94
Citrus	1.83	Residential (rural)	1.01
Walnuts	2.00	Commercial and semi-commercial	2.19
Permanent pasture	3.33	Parks	3.00
Hay and grain	1.50	Schools	1.49
Alfalfa	3.33		

Specific Yield Study - H. F. Blaney, Los Angeles, California.-"V. S. Aronovici reports, 'observations were started on the specific yield equipment described in detail in March 1951. The 7.5-foot soil column was saturated from bottom up over a period of 5 days. When the entire column was saturated and the phreatic water level was exactly at the soil surface (top of column) drainage was started. An outlet was so designed to allow the water level to drop 100 centimeters. The yield and tension rise in the tensiometers was observed daily for a period of 12.5 days. At the end of this period yield had nearly stopped. However, the tensions observed in the tensiometers showed continued rise. The drainage point was lowered a second 100 centimeters. Observations described above were continued.

"Preliminary results indicate that specific yield values as established by the desorption curve of 2-inch cores are low. It is anticipated that continued observations of this column of gravelly sand and other columns of fine sand and loam will suggest the general trends and relation between the values derived from small samples and the large soil column.'"

Water Spreading, San Joaquin Valley.- H. F. Blaney, Los Angeles, California.-"Leonard Schiff reports, 'A preliminary report "Hydrologic Research on Infiltration in the San Joaquin Valley" and a paper prepared on "Water Movements through the Soil" indicate (1) infiltration rates for the topsoils of agricultural areas (as Coshocton) may be comparable to soils of the spreading areas of the San Joaquin Valley. However, rates become limited by the transmission rates in the subsoil of many agricultural areas and tend to fall below that of the soils of the San Joaquin Valley. Some comparisons were made of the effects of bad use at Coshocton and treatments at Bakersfield on infiltration rates. (2) Since ponds are used to determine infiltration rates for different soils of the San Joaquin Valley, consideration is being given to subsurface lateral flow. A subsurface lateral flow factor has been used and is to be correlated with actual subsurface flow. This opportunity factor is based on the size of ponds, for example, a pond of 0.005 acre has an opportunity of 0.24, whereas 350 acres has an opportunity factor of 0.0008. This opportunity is to be considered in determining how representative a pond is of a larger area. Indications are that past performance may have to be reduced by as much as 40 percent to arrive at infiltration rates of larger areas.'

'Various papers and reports are being studied in order to guide experiments. Thought is being given to the expansion of the possible application of information obtained at Bakersfield through consideration of: (1) Testing laboratory treatments on a small field base ; (2) Testing present treatments that have possibilities such as some of the grasses, on larger areas - 1 acre or so. Efforts will be made to locate such areas; and (3) to determine the simplest tests that may be made in any area to facilitate application of findings. A report on this will follow.'"

"Eldred S. Bliss reports, 'in conjunction with tests of the effects of soil treatments on permeability of the soil in small tubes and in field ponds, an experiment has been set up to test effects of various organic materials on aggregation. Work

was begun on two materials this month; (1) cotton seed hulls, and (2) cotton lint. Varying proportions of these materials were added to a total of 44 jars of the two soils being used in the field pond experiments. After thoroughly mixing the organic material with the soil, water was added to the different jars in two different ways, (a) enough water was added to bring the soil to 12 percent moisture (approximately field capacity for these soils) and to bring the organic material to 100 percent moisture. With the large proportion of organic material being tested in some of the jars the moisture-holding capacity of the mixture is considerably increased over that of the soil alone and it was thus necessary to add a considerable excess of water even over the 100 percent for the organic material in order to get the water distributed throughout the soil. These jars will be allowed to dry down to 12 percent + 100 percent and then held constant at that weight for the remainder of a 2-day incubation period at 30 C.; (b) enough water was added to the other group of jars to completely saturate them and a head of water is maintained over the top of the soil at all times.

"At the conclusion of this "incubation" all jars will be dried and water-stable aggregation determined by the wet sieve method. Small perc. tubes will be packed with the soils and tests run. Microbiological studies will be made to determine what groups of organisms are responsible for varying degrees of aggregation.'"

"Curtis E. Johnson reports, 'percolation tests are being continued on artificially packed soil columns in percolation tubes. At present tests are being made of methods of incubating a gin trash and soil misture. The two methods are: (1) Continuous flooding; and (2) intermittent flooding by frequent irrigation. The incubation is followed by air drying. The soil columns are then given a test run by continuous flooding and daily percolation rates recorded for the various treatments. It has been noted that on the test run certain tubes have given erratic results. For example, out of a group of six tubes receiving the same amount of gin trash with soil and having been given the same incubation, one tube may have a percolation rate several times higher or lower than the average for the group. This is especially true of tubes containing a mixture of soil and organic materials. It is thought that the cause of this erratic behavior is the swelling and shrinking of the soil column in the tube during incubation, drying and re-wetting. To eliminate this problem the soil will have to be removed from the tubes after incubation and drying and repacked before the test run is made. This method will be tried on future tests.

'A study was started this month to determ ne the amount of water soluble material that is present in various plant materials used in percolation tests. The water soluble portion is an important part of the organic material which serves as an immediate source of energy for micro-organisms. Results of these determinations will be reported later.'"

Water Resources in the South Coastal Basin - H. F. Blaney, Los Angeles, California."At the request of the Washington Office a brief report was prepared on 'Some Aspects of the Water Resources and Land of the South Coastal Basin, California.' This Basin includes about 4,600 square miles of area tributary to Los Angeles, San Gabriel, and Santa Anna rivers and smaller streams entering the Pacific Ocean, and occupies portions of Los Angeles, Orange, Riverside, and San Bernardino counties in California.

"The agricultural areas, as well as the urban and metropolitan communities, are entirely dependent upon the water supply originating in this 4,600-square mile area, except for the importations of water through the Los Angeles City Owens Valley and the California State Colorado River aqueducts.

"A preliminary estimate of the supply and disposal of water of the South Coastal Basin made recently by the California State Division of Water Resources is shown in table 1.

Table 1.--Summary of estimated mean seasonal supply and disposal of water, South Coastal Basin, Calif.

Sub-basin	Mountain and foothill runoff	Precipitation on valley and mesa lands	Imported water supply	Total supply	Consumptive use	Outflow to ocean
	Ac. ft.	Ac. ft.	Ac. ft.	Ac. ft.	Ac. ft.	Ac. ft.
Los Angeles and San Gabriel	262,000	383,000	361,000	1,006,000	878,000	128,000
Santa Ana	326,000	986,000	35,000	1,347,000	1,305,000	42,000
Totals	588,000	1,369,000	396,000	2,353,000	2,183,000	170,000

"It is estimated that 42,000 acre-feet of water is lost annually by evapotranspiration of non-economic water-loving plants in swampy areas and along stream channels. Under a complete conservation program, at least one-half could be salvaged and put to beneficial use.

"Some 1,200,000 acre-feet of water is applied annually to the agricultural lands in the South Coastal Basin. Although the irrigation practices in this area are at present far above the average in efficiency, a further increase of 10 percent in efficient use of water could be accomplished in some sections."

Irrigation Water Management and Drainage Practices in the Production of Hay and Forage in the High Mountain Valleys of Colorado - H, K. Rouse, Gunnison, Colorado.-"The first phase of the Feeding Experiment conducted by Gunnison County Feeding Research Corporation ended on April 26. This experiment is carried on with the cooperation of the Colorado A & M College Agricultural Experiment Station, the U. S. Department of Agriculture, Bureau of Plant Industry, Soils, and Agricultural Engineering, and Soil Conservation Service--Research, Division of Irrigation. The experiment has also had cooperation from Gunnison County and many local ranchers and businessmen. One of the principal objectives of the Corporation is that of determining through actual feeding experiments the values of findings of Mountain Meadow Research.

"The 120-day test just ended utilized 8 pens, each containing 10 heifer calves. (Herefords). Ten owners each loaned 8 animals, one of which was assigned to each pen. Each pen received a different ration. Hay had been produced, harvested, and stored under Mountain Meadow Research staff supervision. The feeder was employed by Colorado A & M College. All hay was weighed in and the uneaten hay was removed and weighed. The feed racks were kept filled at all times so that the calves had all they would eat. The summary gives the overall experience for the 120-day test, copy of which can be obtained from the project.

"As mentioned above, this represents only the first phase of the experiment. The calves all bear the owners' brand and a cheek brand showing pen number. The calves will be handled through summer and fall by their owners in accordance with their usual practice. Most of them will be bred. Some owners utilize the National Forest for range, others have allotments on Public Domain. Some will be kept on the home ranch pastures. About December 1, the animals will be reassembled, weighed in and go on another feeding test, for about 150 days until calving is completed. It

is hoped that the experiment may be continued through a third year.

"The conclusions drawn from this phase are:
(1) The use of commercial fertilizers increase the yield of native hays in tons per acre without depressing the feed value of the hay. The feed value of the hay, ton for ton, is as great, or greater, for hay grown with nitrogen, or phosphorous, or combinations of the two commercial fertilizers as for hay grown without the use of commercial fertilizer. This is equally true for early and late cut hay.

"(2) The feed value, ton for ton, of early cut hay is materially greater than that of late cut hay, whether grown with commercial fertilizers or without. In the two direct comparisons it required an average of 35 percent more late cut hay to achieve the same increase in weight.

"(3) Within the limits of this experiment, the rate of gain is directly proportional to the percentage of crude protein in the ration. This was true whether the ration included only hay or hay and cottonseed cake in combination.

"(4) Because it was necessary to go beyond the measured areas on the ranch to obtain a sufficient quantity of hay grown without fertilizer, exact figures of yield are lacking. Based on estimates of the missing information, it appears that in feeding operations, the use of early cut hay produced with either nitrogen or phosphorous commercial fertilizers will result in a gross profit of approximately $44.00 per acre more than when using late cut hay produced without commercial fertilizer.

"These conclusions are applicable in the High Mountain Valleys of Colorado. One interesting, and as yet unexplained, observation is that the animals consumed pen averages of from 9.0 to 9.8 pounds of hay per day during the first 14 weeks of the test. Then abruptly their appetites increased and during the final 3 weeks of the test, the consumption increased to pen averages of from 16.1 to 16.6 pounds per animal day." At all times during the 120-day test feed racks were kept full so that the calves could have all they would eat."

Performance Tests of Well Screens - C. Rohwer, Ft. Collins, Colorado.- "Tests of the flow of water through special screens with drilled perforations were completed by Mr. Petersen. These tests were made without gravel envelopes. They show that the distribution of flow into the screen follows the theoretical law quite closely. Preliminary tests have been made on one of the special screens with a gravel envelope to determine the nature of the losses under these conditions.

"The question whether the head-loss curves are the same when the water is flowing downward in the pipe as when it is flowing upward has been raised from time to time. For this reason a series of tests was run when the water was drawn from the upper end of one of the screens. The results show that this procedure did not change the shape of the curves or the magnitude of the losses. The only difference in the curves for a particular discharge is that the top of one curve is the bottom of the other. This confirms our original assumption when planning the tests.

"Mr. Frank Leatherwood has been conducting model studies of the loss of head and the flow of sand through a gravel envelope. A plexiglass tube is being used for these tests. Some difficulty is being experienced in making these tests because it it not possible to maintain a vertical face between the sand and the gravel in the tube. These experiments will be continued. Standard permeability tests were run on the 1/16 and 1/8-inch gravel used for the gravel envelopes. These tests indicate

that the permeability varies with the head for coarse material of uniform size. To keep within safe values of Reynold's number a very small difference in head must be maintained on the sample.

"The data on the effect of angle of tube on the efficiency of the vortex tube sand trap have been tabulated. For these tests the change in the rate of rotation of the vortex and in the velocity of translation in the tube were used in making the comparisons. The rate of rotation of the vortex increases with the velocity in the channel. This is true also for the velocity of translation but the increase is not so great. The best results were obtained when the tube was at an angle of 45° with the axis of the channel."

Irrigation Studies - L. J. Erie, Brookings, South Dakota.-"The bulletin 'Consumptive-use and Irrigation Requirement of Crops for South Dakota' was completed this month and is now being typed. A bulletin 'Irrigation in South Dakota,' as prepared by the Subcommittee on irrigation of the South Dakota State agricultural coordinating committee was published this month. I am one of the four members of this sub-committee."

Irrigation and Drainage Research in Utah - V. E. Hansen, Logan, Utah.- "The following information relating to consumptive use is abstracted from the Irrigation section of the 1950 Annual Progress Report of the Western Regional Project W-9 entitled, 'Irrigation, Fertilization, and Soil Management of Crops in Rotation' being conducted at Logan, Utah.

"One phase of the project consists of the application of water by sprinkling to different crops under different fertility levels and four moisture levels. The water was applied when the tension of the root zone dropped to a predetermined level. For the driest plots, the average percent available moisture during the growing season was about 20 percent; on the next to the driest plots 25 percent; on the medium wet plots 35 percent; and for the wettest plots 60 percent. This means that on the wet plots the average percent of available moisture was 60 percent during the growing season. Generally speaking, the maximum yields from the plots were obtained from either the medium wet or wettest plots. Analyzing the amount of water applied as determined by the moisture tension, it was observed that the maximum daily rate of use on all but the wettest plots was essentially the same. This rate, approximately 0.3 of an inch per day, was reached by each of the lower moisture levels on alfalfa, sugar beets, and potatoes. The maximum rate of use on the wettest plots on the three crops was approximately 0.5 of an inch per day. The increased rate by the wettest plots was due primarily to deep percolation losses in the deep homogeneous soil on which the experiment was conducted. The dry plots maintained the maximum rate for a very short time, whereas, the wetter plots reaching the maximum rate of use rather early in the season and maintaining that rate during the balance of the season until after the major moisture demands had passed. These observations would indicate that the difference in water application is quite significant in the earlier part of the season when the roots are not extensive enough to extract from a relatively large region of soil. Consequently, when the average moisture is low, the result is a low water use and a low rate of growth of the plant; whereas, with the high moisture content during the entire season, the rate of use is relatively high allowing the young short roots to obtain enough water to meet the maximum needs. This supports the concept that the plant should not be allowed to suffer for moisture, such being particularly true in the earlier stages of the plant growth when the roots do not have the moisture gathering potential that they possess later in the season. The data indicate the relative value

of using a limited water supply by early, frequent, light applications in preference to heavier applications later in the season. It is recognized that on some crops which require a heavy water demand later in the season to produce the fruit, such is not possible, but apparently on alfalfa, sugar beets, and potatoes considerably more attention can be given to more frequent irrigations earlier in the season. The fact that the dry plots reached about the same peak rate as the wetter plots, indicated that by the period of maximum demand the roots are extended sufficiently to meet this need, but the moisture available in the soil limits the length of time that the roots can extract at this rate. The data show that the higher the average moisture level, the longer the crop extracts moisture at the maximum rate.

"Since the experiment is set up on a rotation plan, the coming year will allow further intensive study of this relationship with a subsequent refinement of techniques and a closer correlation between moisture needs and irrigation. The data thus obtained will be analyzed more fully along these general lines to determine the extent of the indications shown through the past year's data."

Irrigation Studies - F. M. Tileston, Ontario, Oregon.-"Considerable difficulty was experienced in taking soil-moisture samples by a King soils tube on the Ed Ker ranch. Several soil type tips were broken or bent by shattered rock in the process of taking soil samples. A tip was finally sent to Logan, Utah, where it was remodeled in accordance with a proposed design which it was thought might enable us to drive the tubes through partially shattered rocks.

"The tip was essentially re-designed so that the end was somewhat blunted and when it comes in contact with hard rock or other obtuse material the tip would not be broken or bent. We have used this new tip and it is working very satisfactory. However, in order to drive this modified tip it is necessary to use a 25-pound driving hammer."

Water-Supply Forecast - C. Houston, Reno, Nevada.-"Annual streamflow forecast meetings were again held in Elko, Winnemucca, Lovelock, Minden, Fallon, and Yerrington. At these meetings, attended by farmers, representatives of water users organizations and public officials, we attempt to pool all hydrologic information in order to arrive at a forecast of irrigation season streamflow. Our forecast for 1951 ranges from extreme drought conditions in the south to about 150 percent of normal in the north. Runoff of snow stored water will be less than 50 percent of normal from the Sierra while the central and southern part of the State will realize only from 10 to 25 percent of normal. Lake Mead contains 95 percent of last year and less than 90 percent of normal for this date. Snowfall during April was below normal which further decreases the conditions mentioned above. On the headwaters of Truckee River and Lake Tahoe snow stored water is about 25 percent of normal while on the Carson River headwaters it is only 40 percent. Donner Summit which usually contains about 5 feet of snow is bare."

Irrigation Studies - C. Houston, Reno, Nevada.-"Lands in the Stillwater Soil Conservation District on the lower end of the Truckee-Carson Irrigation District near Fallon, contain large areas of combined sodium soils. This is the number one problem in this District. In an attempt to reach some solution our Division and Operations are cooperating with the Nevada Agricultural Experiment Station on studying gypsum applications. The Experiment Station is using their applicator which applies gypsum direct to the irrigation water flowing into one border. Another border contains gypsum spread on the soil surface at the rate of 6 tons per

acre. A third border containing no amendments is used as a control. Weirs were set at the head and foot of the three study borders. Each border is 66' x 1080', or about 1.64 acres. Water applied and water running off of each border is measured and soil samples are obtained before and after irrigation."

Irrigation Tests - S. J. Mech, Prosser, Washington.-"The first irrigation of the season was made on April 17 - 20 on the wet plots. The wheat seeded on March 16 began emerging the last week of March. In spite of this vegetative cover, on April 16 the soil losses for this irrigation were heavy. The top 4 inches of the seed bed was loose and dry. The roots couldn't tie the soil particles together. Even a small stream moved much soil.

"Subsequent irrigations on these plots will flow in furrows which will have been consolidated by water. This, together with the increased root development, should produce only negligible erosion losses for the rest of the wheat season.

"Infiltration rates for this irrigation started quite high and the plowed layer, with its chopped cornstalk, was soon saturated. Infiltration then dropped sharply until after about 12 hours it was similar to last year's corn results. In general it took 30 - 36 hours to add 4-1/2 inches of water to the soil.

"Wheat used only 0.48 inch of water from the soil during the period March 28 to April 16. Soil samples taken on these two dates show a soil-moisture loss of only 0.024 inch per day during the 20-day period. During this period, the top 3 inches of the field was dust. Some unsprouted wheat grains have been found in this layer. The wheat began to emerge about March 25. It began to stool-out about April 20.

"The plots irrigated on April 17 - 20 show no increase in vegetative density or height over those which have only the winter's accumulation of moisture. They do, however, show a lighter green color. The other plots are a darker green and as yet show no soil-moisture deficiency.

"The available soil moisture at the time of irrigation was a little above 50 percent of total capacity. At the end of April the wet plots, with one irrigation, have an estimated available soil moisture of about 85 percent. The medium and the dry ones are estimated at about 35 percent. The medium plots are being readied for their first irrigation."

6/18/51